

# B R E V I O R A

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### THE CHOANAL PAPILLAE OF THE CHELONIIDAE

By THOMAS S. PARSONS

Harvard Biological Laboratories  
Cambridge, Mass.

#### INTRODUCTION

There appear to be no published descriptions of the papillae which are found along the lateral margin of the choanae or internal nares in the members of the Cheloniidae. They are mentioned in two papers, Deraniyagala (1939) and Carr (1942), but in each case only the number present is noted and given as a generic character.

The following note is based primarily on the study of two heads of *Chelonia mydas* which were obtained from the Carolina Biological Supply Company. Supplementary observations were made on specimens in the collections of the Museum of Comparative Zoology. Histological investigations were confined to *Chelonia mydas*. The specimens had been preserved in formalin and were stained with hematoxylin and eosin and by the Bielschowsky silver method. A third method, Mallory's triple connective tissue stain, was tried, but did not prove successful.

I am indebted to Dr. E. E. Williams for allowing me to examine the specimens in the Museum of Comparative Zoology, and for his advice throughout the course of this study. Thanks are also due to Dr. A. B. Dawson and Mrs. T. S. Parsons for advice and assistance in making the histological preparations.

#### CHELONIA MYDAS

In *Chelonia mydas* the papillae form a row along the entire lateral margin of the choana. They are long and narrow conical

projections of irregular length, so that the row of papillae appears quite uneven. In the anterior two-thirds of the choana, they tend to be longer and more prominent, with approximately half of the width of the choana occupied by the papillae; farther posteriorly they do not extend out into the choana any great distance. Deraniyagala (1939) reports not only a lateral row, but also a single anteromedial papillary vestige. However no such vestige was seen in any of the specimens studied in the present investigation.

The number of papillae in the lateral row is not constant. Carr (1942) states only that they are numerous, and Deraniyagala (1939) that there are eight. Unfortunately the latter author does not mention the number of specimens which he examined. In the two adults dissected for the present study there were eleven to fourteen papillae on either side (one had thirteen on each side, the other eleven on the left and fourteen on the right). The only other adult specimen which was examined (MCZ 7150) possessed ten papillae on the right side and eleven on the left. Thus there are probably ten or more papillae along the lateral margin of each choana in most fully mature *Chelonia mydas*; however this is not true of juveniles. In three specimens under six inches in total length (MCZ 1413, 1414, and 29594) there was only a single, rather weakly developed papilla near the anterior end of the lateral margin of each choana. A larger juvenile (MCZ 3454) possessed two papillae on the right side and three on the left.

In section, each papilla can be seen to consist of two major histologic elements. First there is a thick, cornified, stratified squamous epithelial covering, and secondly a mass of dense connective tissue forming a central core. Plate II shows transverse sections of papillae. The upper section, stained with hematoxylin and eosin, was taken near the center of the papilla, while the lower one, stained by the Bielschowsky silver method, was taken near the base.

The epithelium closely resembles normal body epidermis. In some regions all four strata — germinativum, granulosum, lucidum, and corneum — are well developed. The first and last are present throughout, but the granulosum and lucidum are not always recognizable. There is a gradual increase in the thickness

of the stratum corneum from a minimum at the base of the papilla to a maximum at its tip. The external surface of the epithelium is relatively even at the distal end of the papilla, but basally it becomes irregular with numerous small projections and, more rarely, indentations. As in typical epidermis, the boundary between the epithelium and the underlying connective tissue is generally a rather wavy line, although near the tip of the papilla it becomes far more even. No basement membrane could be seen; in fact the fibers of the connective tissue appear to continue into the basal epithelial cells. However in human epidermis, which appears similar when viewed through a light microscope, a thin basement membrane can be demonstrated by electron microscopy (Maximow and Bloom, 1957).

The core of the papilla is a mass of typical dense connective tissue. Irregularly arranged bundles of collagenous fibers occupy most of the space, but there are numerous included cells and small relatively clear areas. The cellular constituents of the connective tissue were not identified in the present study. Within the connective tissue there are quite numerous very small blood vessels; however only a single arteriole and venule could be found at the base of the papilla, and the tissue is not very heavily vascularized. No nerve fibers or endings could be recognized. However nerve fibers would resemble most closely the fibers of the connective tissue, and thus be very difficult to demonstrate. Presumably there are some nerves present; certainly the lining of the oral cavity is well innervated in most forms.

#### OTHER CHELONIDS

Plate 1, lower figure shows a specimen of *Caretta caretta*. In this specimen (MCZ 53133) there is a single choanal papilla located near the anterior end of the lateral margin of the choana. This is in agreement with the findings of both Deraniyagala (1939) and Carr (1942). The form of the papilla is essentially similar to that found in *Chelonia mydas*, but it appears to be slightly shorter and broader in *Caretta*.

The only specimen of *Chelonia depressa* which was examined (MCZ 54712) is a juvenile, and possesses a single choanal papilla exactly like that of *Chelonia mydas* juveniles.

In *Erctmochelys imbricata*, Deraniyagala (1939) found a single choanal papilla, and Carr (1942) reports one or two papillae. All seven specimens examined for the present study (MCZ 1138, 1141, 1416, 1418, 4049, 49406, and 49407) possess a single papilla exactly like that of *Caretta*.

No specimens of *Lepidochelys* were seen by me. Both Deraniyagala (1939) and Carr (1942) report a single choanal papilla like that found in *Caretta*.

### FUNCTION OF THE PAPILLAE

In adult specimens of *Chelonia mydas* the form of the papillae suggests the possibility that their function is to prevent pieces of food from entering the nasal cavities. However the single choanal papilla of the other cheloniid genera and of juveniles of *Chelonia mydas* could not be very effective in this regard.

According to Deraniyagala (1939), all the cheloniids are omnivorous, preferring an animal diet but often subsisting on purely plant food. *Chelonia* in particular is primarily herbivorous. Its eating habits also differ slightly from the other members of the family in that its "stomach contents are never in a finely divided condition but appear to be 'bolted' entire" (Deraniyagala, 1939, p. 234); the other cheloniids tend to break up their food more. However it does not appear to me that an unchewed piece of alga would cause any more injury than a broken piece of mollusc shell if lodged in the choana or nasal cavity. Thus food habits do not seem to explain the differences between the genera.

Another possible function of the papillae is that they might bear some special sensory receptors. However the histological observations provide no evidence for such a theory, although they are not absolutely conclusive. As was noted above, no nerves or sensory endings were observed in the papillae of *Chelonia*. Since the material was not ideally preserved for histologic study and since nerve fibers would not be clearly differentiated from connective tissue fibers by the stains employed, their absence cannot be considered as proven; in fact, it appears highly probable that there is some sensory innervation of the papillae. However the absence of any conspicuous nerve trunk entering the base of the papilla and of any distinguishable receptors renders it most unlikely that the papillae function primarily in

a sensory capacity. Furthermore, the thickness and high degree of cornification of the epithelium would be surprising, though not impossible, in a sensory structure.

Thus I am unable to suggest any function for the single papilla in *Caretta*, *Eretmochelys*, or *Lepidochelys*. In *Chelonia* (adults) they must serve to prevent the contents of the mouth from entering the nasal cavities; whether or not this is their primary function cannot be stated.

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